Product Specification

AU OPTRONICS CORPORATION

(   ) **Preliminary Specifications**
(V) **Final Specifications**

Module	14.0"(13.97") HD 16:9 Color TFT-LCD
Model Name	B140XW01 V8 Open cell
Note　　( )	

Customer	Date	Approved by	Date
		Jonken Fan	07/31/2012
Checked & Approved by	Date	Prepared by	Date
		Johnny Tu	07/31/2012
Note: This Specification is subject to change without notice.		**NBBU Marketing Division AU Optronics corporation**	

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Record of Revision

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Version and Date	Page	Old description	New Description	Remark
1.0 2012/07/31	All	First Edition for Customer		

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1. Handling Precautions

1) Since front polarizer is easily damaged, pay attention not to scratch it.

2) Be sure to turn off power supply when inserting or disconnecting from input connector.

3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.

4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.

5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.

6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.

7) Do not open nor modify the Module Assembly.

8) Do not press the reflector sheet at the back of the module to any directions.

9) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.

10) After installation of the TFT Module into an enclosure (Notebook PC Bezel, for example), do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.

11) Disconnecting power supply before handling LCD modules, it can prevent electric shock, DO NOT TOUCH the electrode parts, cables, connectors and LED circuit part of TFT module that a LED light bar build in as a light source of back light unit. It can prevent electrostic breakdown.

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2. General Description

B140XW01 V8 is a Color Active Matrix Liquid Crystal Display composed of a TFT LCD panel, a driver circuit, and LED backlight system. The screen format is intended to support the 16:9 HD, 1366(H) x768(V) screen and 262k colors (RGB 6-bits data driver) with LED backlight driving circuit. All input signals are LVDS interface compatible.

B140XW01 V8 is designed for a display unit of notebook style personal computer and industrial machine.

2.1 General Specification

The following items are characteristics summary on the table at 25 ℃ condition:

Items	Unit	Specifications
Screen Diagonal	[mm]	354.95
Active Area	[mm]	309.4 X173.95
Pixels H x V		1366x3(RGB) x 768
Pixel Pitch	[mm]	0.2265X0.2265
Pixel Format		R.G.B. Vertical Stripe
Display Mode		Normally White
Response Time	[ms]	8 typ / 16 Max
Nominal Input Voltage VDD	[Volt]	+3.3 typ.
Power Consumption	[Watt]	1.0 W
Weight	[Grams]	171 g.
Electrical Interface		1 channel LVDS
Thickness	[mm]	1 mm Cell / 1.6mm PCBA
Surface Treatment		Glare, Hardness 3H,
Support Color		262K colors (RGB 6-bit)

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2.2 Optical Characteristics

The optical characteristics are measured under stable conditions at 25℃ (Room Temperature) :

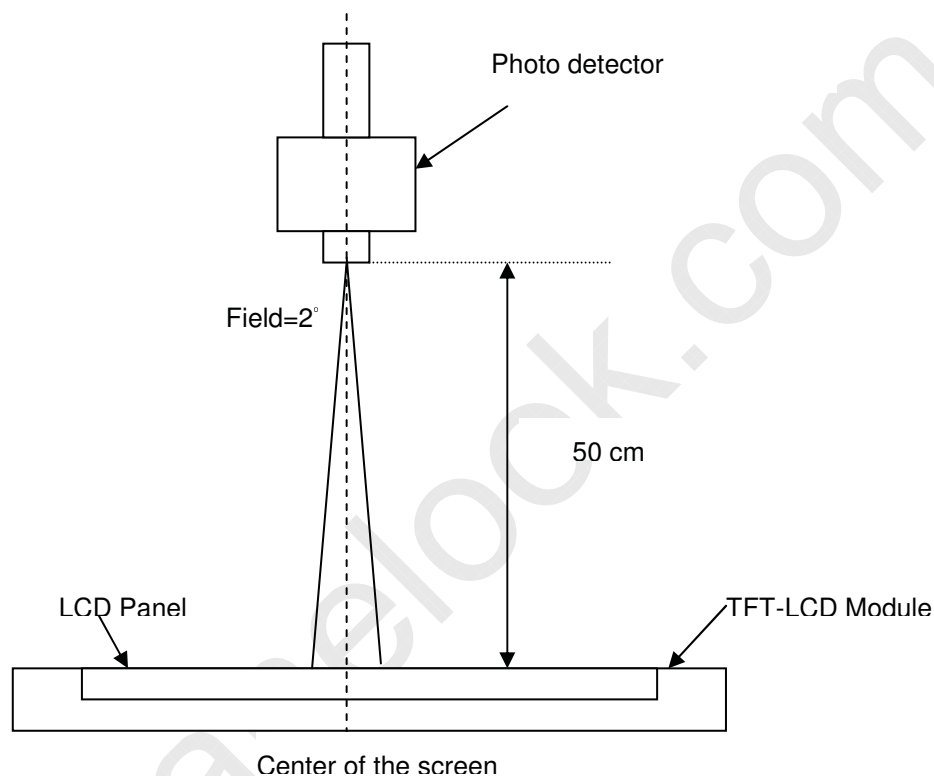| Item	Symbol	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle	θ_R θ_L	**Horizontal (Right)** **CR = 10 (Left)**		40 40	45 45	- -	degree	1, 5
	ϕ_H ϕ_L	**Vertical (Upper)** **CR = 10 (Lower)**		10 30	20 40	- -		
Cross talk	**%**					**4**		1, 3
Response Time	**T$_r$**	**Rising**		-	-	-	msec	1, 4
	T$_f$	**Falling**		-	-	-		
	T$_{RT}$	**Rising + Falling**		-	**8**	**16**		
NTSC	**%**			-	**45**	-		

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Note 1: Measurement method

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a stable, windless and dark room, and it should be measured in the center of screen.

Photo detector

Field=2°

50 cm

LCD Panel

TFT-LCD Module

Center of the screen

Note 2： Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$

Note 3： Definition of Cross Talk (CT)
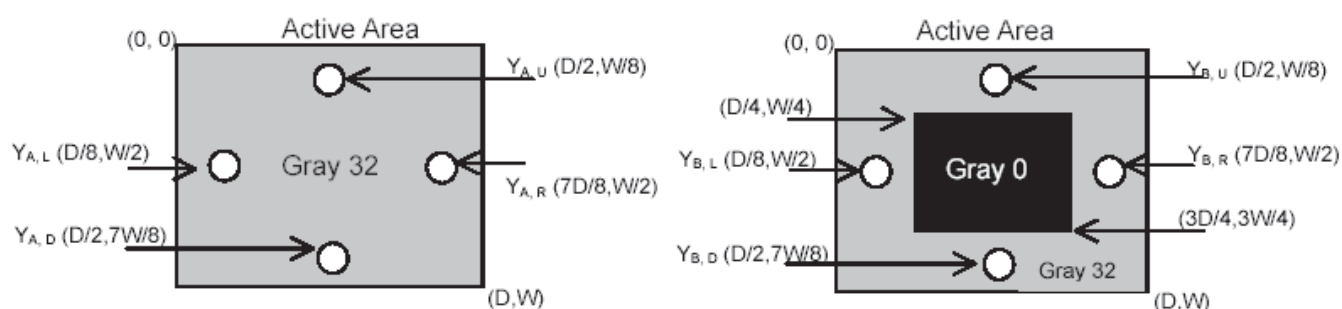
$$CT = |Y_B - Y_A| / Y_A \times 100\ (\%)$$

Where

Y_A = Luminance of measured location without gray level 0 pattern (cd/m2)

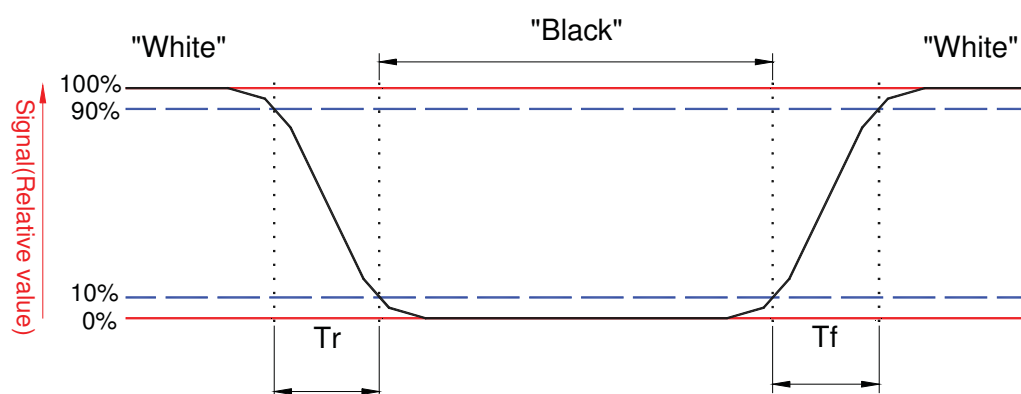Y_B = Luminance of measured location with gray level 0 pattern (cd/m2)

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Note 4: Definition of response time:

The output signals of BM-7 or equivalent are measured when the input signals are changed from "Black" to "White" (falling time) and from "White" to "Black" (rising time), respectively. The response time interval between the 10% and 90% of amplitudes. Refer to figure as below.
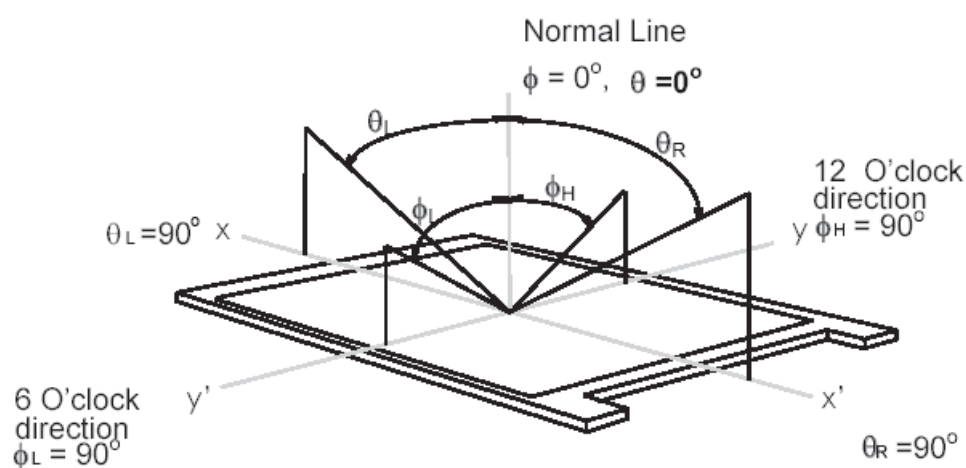
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Note 5. Definition of viewing angle

Viewing angle is the measurement of contrast ratio ≥ 10, at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as follows; 90° (θ) horizontal left and right and 90° (Φ) vertical, high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated about its center to develop the desired measurement viewing angle.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com
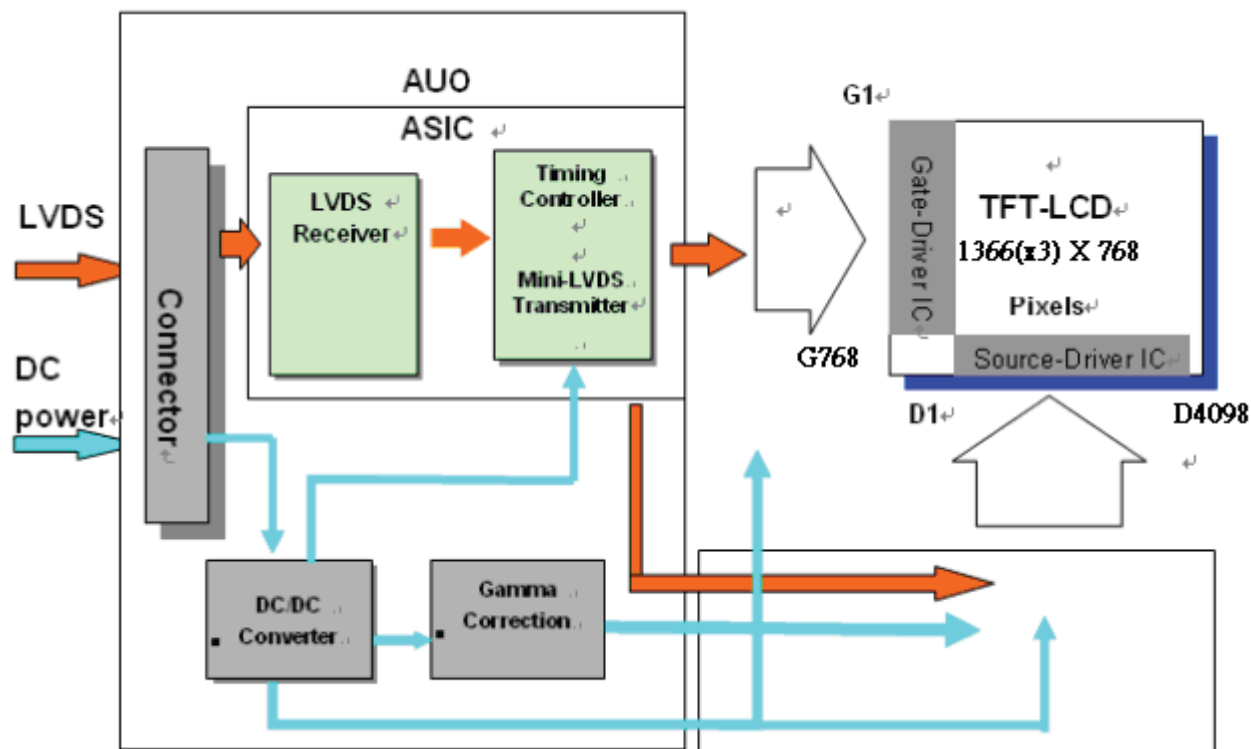
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3. Functional Block Diagram

The following diagram shows the functional block of the 14.0 inches wide Color TFT/LCD 40 Pin one channel Module

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4. Absolute Maximum Ratings

An absolute maximum rating of the module is as following:

4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	Vin	-0.3	+4.0	[Volt]	Note 1,2

4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit	Conditions
Operating Temperature	TOP	0	+50	[^{o}C]	Note 4
Operation Humidity	HOP	5	95	[%RH]	Note 4
Storage Temperature	TST	-20	+60	[^{o}C]	Note 4
Storage Humidity	HST	5	95	[%RH]	Note 4

Note 1: At Ta (25℃)

Note 2: Permanent damage to the device may occur if exceed maximum values

Note 3: LED specification refer to section 5.2

Note 4: For quality performance, please refer to AUO IIS (Incoming Inspection Standard).

Operating Range　　　　　　　Storage Range

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5. Electrical Characteristics

5.1 TFT LCD Module

5.1.1 Power Specification

Input power specifications are as follows;

The power specification are measured under 25℃ and frame frenquency under 60Hz

Symble	Parameter	Min	Typ	Max	Units	Note
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	
PDD	VDD Power	-	-	1.0	[Watt]	Note 1
IDD	IDD Current	-	267	333	[mA]	Note 1
IRush	Inrush Current	-	-	2000	[mA]	Note 2
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	100	[mV] p-p	

Note 1 : Maximum Measurement Condition：Black Pattern at 3.3V driving voltage. ($P_{max}=V_{3.3}$ x I_{black})

Note 2：Measure Condition

Vin rising time

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5.1.2 Signal Electrical Characteristics

Input signals shall be low or High-impedance state when VDD is off.

Signal electrical characteristics are as follows;

Parameter	Condition	Min	Max	Unit
V_{th}	Differential Input High Threshold (Vcm=+1.2V)		100	[mV]
V_{tl}	Differential Input Low Threshold (Vcm=+1.2V)	-100	-	[mV]
V_{ID}	Differential Input Voltage	100	600	[mV]
V_{cm}	Differential Input Common Mode Voltage	1.125	1.375	[V]

Note: LVDS Signal Waveform

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6. Signal Interface Characteristic

6.1 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.

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6.2 The Input Data Format

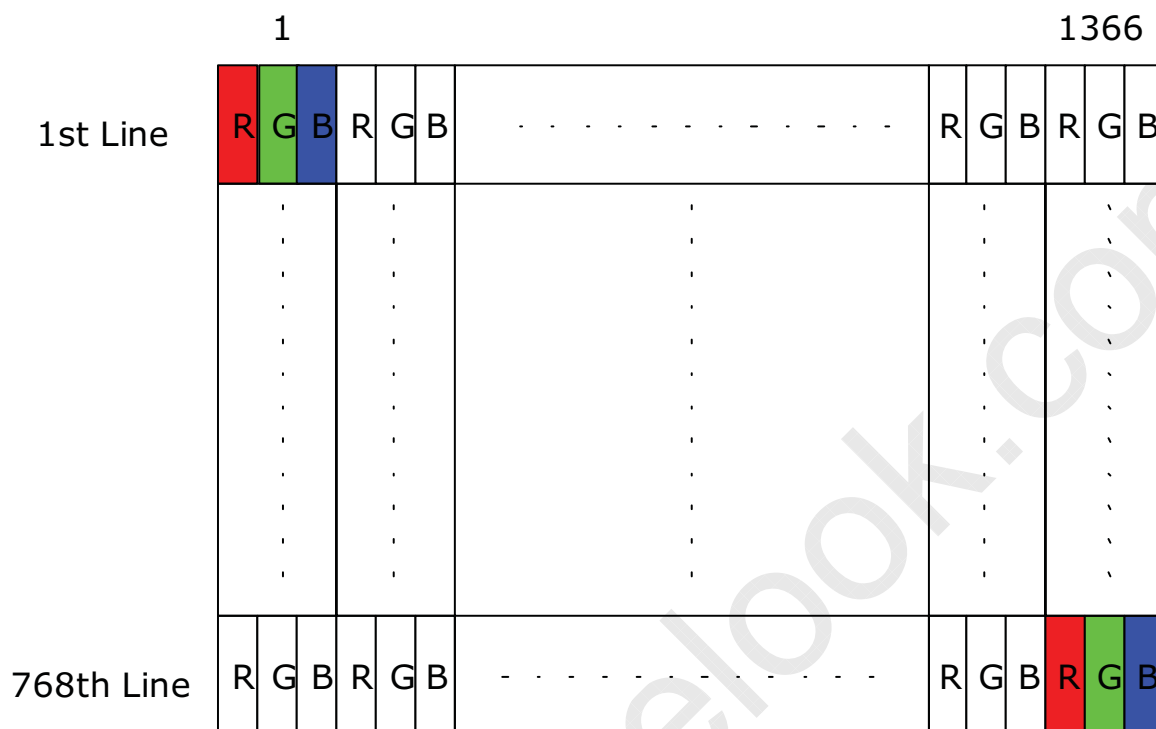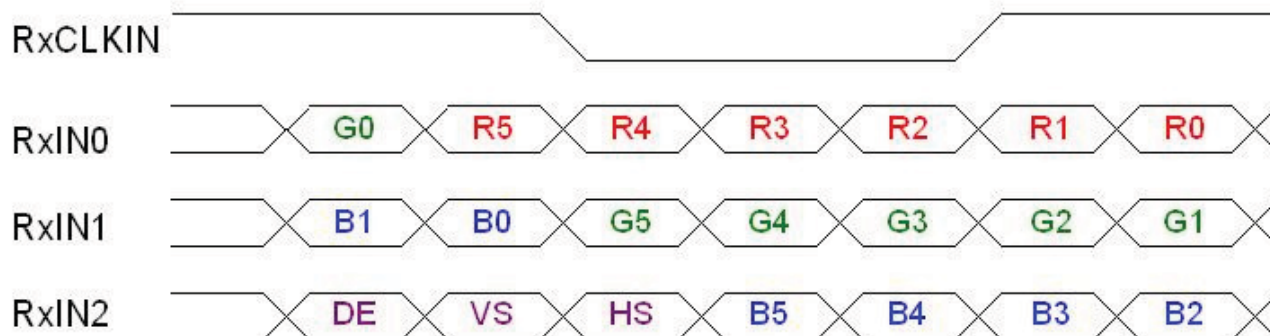| Signal Name	Description	
R5 R4 R3 R2 R1 R0	Red Data 5 (MSB) Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB) Red-pixel Data	Red-pixel Data Each red pixel's brightness data consists of these 6 bits pixel data.
G5 G4 G3 G2 G1 G0	Green Data 5 (MSB) Green Data 4 Green Data 3 Green Data 2 Green Data 1 Green Data 0 (LSB) Green-pixel Data	Green-pixel Data Each green pixel's brightness data consists of these 6 bits pixel data.
B5 B4 B3 B2 B1 B0	Blue Data 5 (MSB) Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB) Blue-pixel Data	Blue-pixel Data Each blue pixel's brightness data consists of these 6 bits pixel data.
RxCLKIN	Data Clock	The signal is used to strobe the pixel data and DE signals. All pixel data shall be valid at the falling edge when the DE signal is high.
DE	Display Timing	This signal is strobed at the falling edge of RxCLKIN. When the signal is high, the pixel data shall be valid to be displayed.
VS	Vertical Sync	The signal is synchronized to RxCLKIN .
HS	Horizontal Sync	The signal is synchronized to RxCLKIN .

Note: Output signals from any system shall be low or High-impedance state when VDD is off.

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6.3 Integration Interface Requirement

6.3.1 Connector Description

Physical interface is described as for the connector on module.

These connectors are capable of accommodating the following signals and will be following components.

Connector Name / Designation	For Signal Connector
Manufacturer	STM
Type / Part Number	MSAK24025P40
Mating Housing/Part Number	Mating of MSAK24025P40

6.3.2 Pin Assignment

LVDS is a differential signal technology for LCD interface and high speed data transfer device.

PIN#	Signal Name	Description
1	NC	No Connection (Reserve)
2	VDD	Power Supply +3.3V
3	VDD	Power Supply +3.3V
4	VEDID	EDID +3.3V Power
5	NC	No Connect (Reserve)
6	CLK_EDID	EDID Clock Input
7	DAT_EDID	EDID Data Input
8	RxOIN0-	-LVDS Differential Data INPUT(Odd R0-R5,G0)
9	RxOIN0+	+LVDS Differential Data INPUT(Odd R0-R5,G0)
10	VSS	Ground
11	RxOIN1-	-LVDS Differential Data INPUT(Odd G1-G5,B0-B1)
12	RxOIN1+	+LVDS Differential Data INPUT(Odd G1-G5,B0-B1)
13	VSS	Ground
14	RxOIN2-	-LVDS Differential Data INPUT(Odd B2-B5,HS,VS,DE)
15	RxOIN2+	+LVDS Differential Data INPUT(Odd B2-B5,HS,VS,DE)
16	VSS	Ground
17	RxOCKIN-	-LVDS Odd Differential Clock INPUT
18	RxOCKIN+	-LVDS Odd Differential Clock INPUT
19	VSS	Ground
20	NC	No connection
21	NC	No connection
22	VSS	Ground

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23	NC	No connection
24	NC	No connection
25	VSS	Ground
26	NC	No connection
27	NC	No connection
28	VSS	Ground
29	NC	No connection
30	NC	No connection
31	VLED_GND	LED Ground
32	VLED_GND	LED Ground
33	VLED_GND	LED Ground
34	NC	No Connection (Reserve)
35	S_PWMIN	System PWM signal Input
36	BL_ON	LED enable pin(+3V input, +5V tolerance)
37	NC	No Connection (Reserve)
38	VLED	LED Power Supply 6V - 21V
39	VLED	LED Power Supply 6V - 21V
40	VLED	LED Power Supply 6V - 21V

Connector

Pin 40   **Pin 1**

VLED   NC

Note1: Input signals shall be low or High-impedance state when VDD is off.

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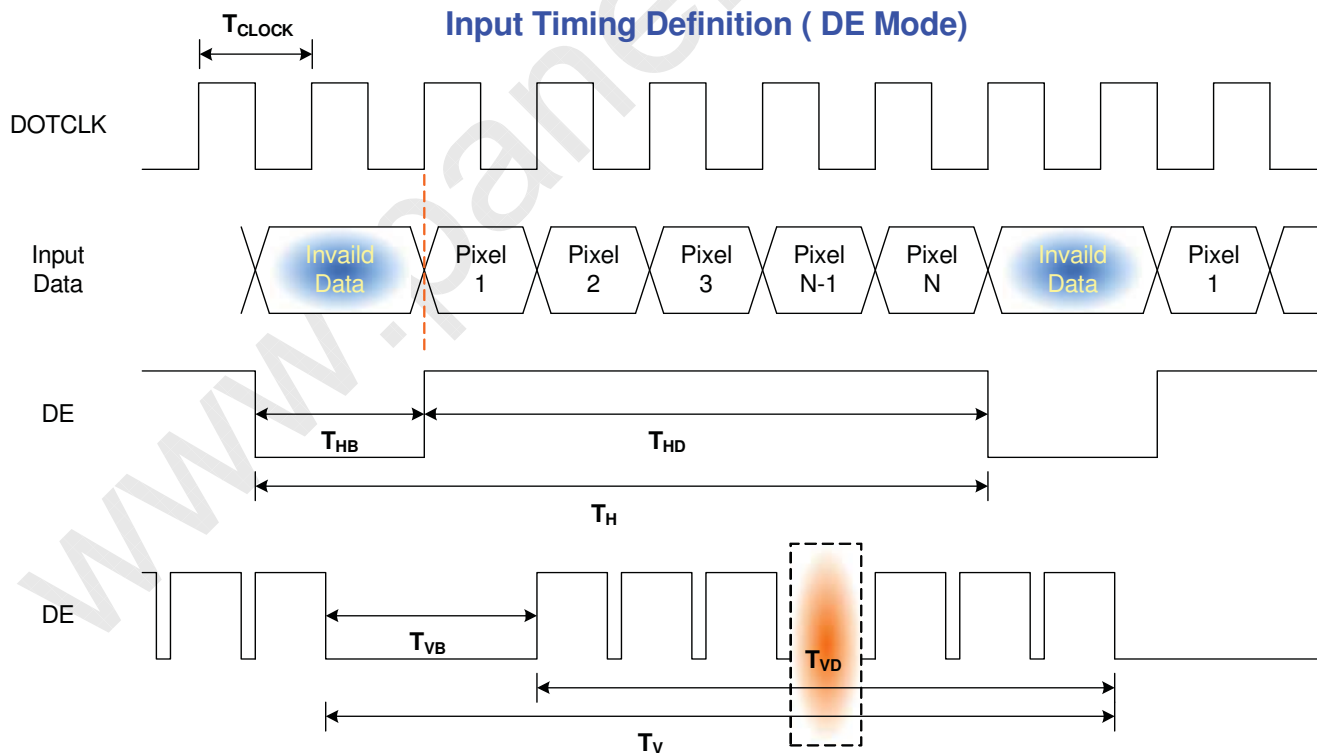## 6.4 Interface Timing

6.4.1 Timing Characteristics

Basically, interface timings should match the 1366x768 /60Hz   manufacturing guide line timing.

Parameter		Symbol	Min.	Typ.	Max.	Unit
Frame Rate*1		-	-	60	-	Hz
Clock frequency		1/ T_{Clock}	50	69.3	80	MHz
Vertical Section	Period	T_V	776	808	1023	T_{Line}
	Active	T_{VD}		768		
	Blanking	T_{VB}	8	35	255	
Horizontal Section	Period	T_H	1396	1436	2047	T_{Clock}
	Active	T_{HD}		1366		
	Blanking	T_{HB}	40	70	681	

Note : DE mode only

   *1:Support customer system LVDS(50Hz/40Hz).

6.4.2 Timing diagram
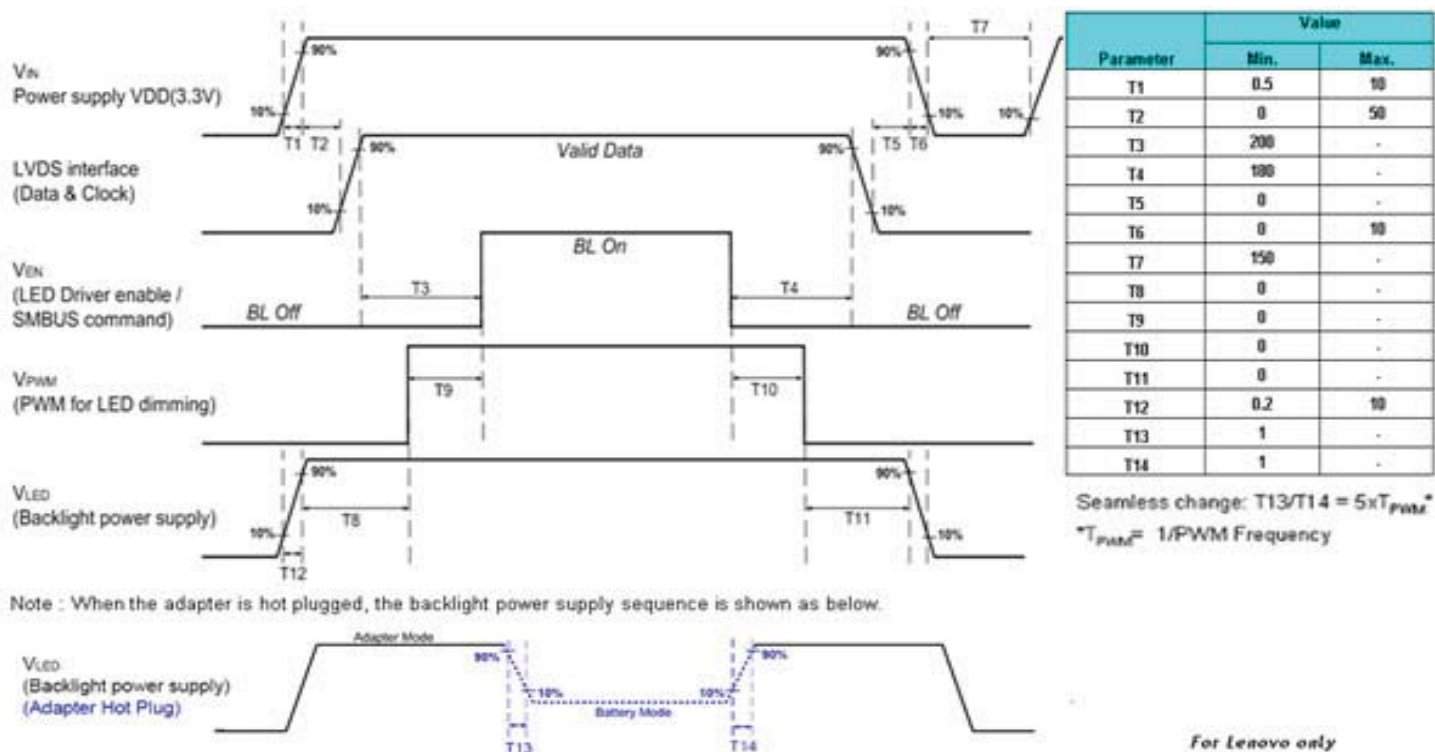

Input Timing Definition (DE Mode)

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6.5 Power ON/OFF Sequence

Power on/off sequence is as follows. Interface signals and LED on/off sequence are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off. Besides, no problem in the condition that PWM will be put into T-CON even when VDD is off

Parameter	Value	
	Min.	Max.
T1	0.5	10
T2	0	50
T3	200	-
T4	180	-
T5	0	-
T6	0	10
T7	150	-
T8	0	-
T9	0	-
T10	0	-
T11	0	-
T12	0.2	10
T13	1	-
T14	1	-

Seamless change: $T13/T14 = 5 \times T_{PWM}$*

*$T_{PWM} = 1/PWM$ Frequency

Note : When the adapter is hot plugged, the backlight power supply sequence is shown as below.

For Lenovo only

Note 1 : If T3,T4<200ms; T7<500ms; T8,T9,T10,T11<10ms，The display garbage may occur. We suggest T3,T4>200ms; T7>500ms; T8,T9,T10,T11>10ms to avoid the display garbage.

Note 2：If T1 or T12<0.5ms，the inrush current may cause the damage of fuse. If T1 or T12<0.5ms，the inrush current I2t is under typical melt of fuse Spec.，there is no mentioned problem.

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7. Panel Reliability Test

7.1 Vibration Test

Test Spec:

- Test method:　Non-Operation
- Acceleration:　1.5 G
- Frequency:　　10 - 500Hz Random
- Sweep:　　　　30 Minutes each Axis (X, Y, Z)

7.2 Shock Test

Test Spec:

- Test method:　Non-Operation
- Acceleration:　220 G , Half sine wave
- Active time:　　2 ms
- Pulse:　　　　　X,Y,Z .one time for each side

7.3 Reliability Test

Items	Required Condition	Note
Temperature Humidity Bias	Ta= 40℃, 90%RH, 300h	
High Temperature Operation	Ta= 50℃, Dry, 300h	
Low Temperature Operation	Ta= 0℃, 300h	
High Temperature Storage	Ta= 60℃, 35%RH, 300h	
Low Temperature Storage	Ta= -20℃, 50%RH, 250h	
Thermal Shock Test	Ta=-20℃ to 60℃, Duration at 30 min, 100 cycles	
ESD	Contact : ±8 KV Air : ±15 KV	Note 1

Note1: According to EN 61000-4-2 , ESD class B: Some performance degradation allowed. No data lost

.　Self-recoverable. No hardware failures.

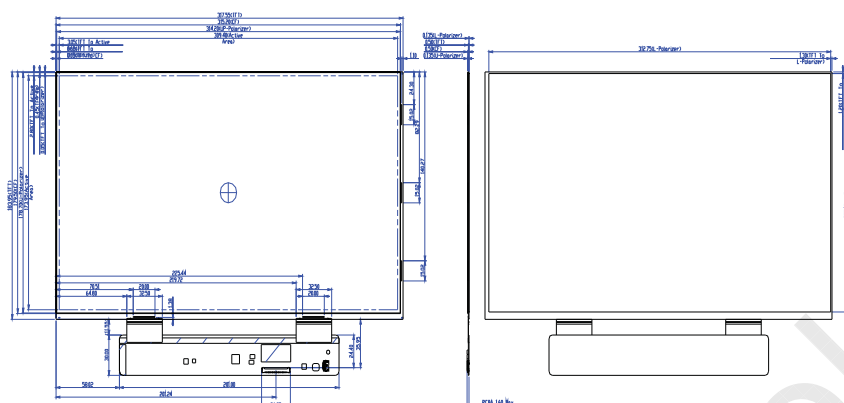**Remark:** MTBF (Excluding the LED): 30,000 hours with a confidence level 90%

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8. Mechanical Characteristics

8.1 LCM Outline Dimension

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9. Shipping

9.1 Shipping Label Format

AU Optronics   QTY：35   RoHS   Pb

  MODEL NO：B140XW01 V8

  PART NO：91.14B38.821

  CUSTOMER NO：

  CARTON NO：

  Made in China   *ZM100-0652300205*

AU Optronics   QTY：35   RoHS   Pb

  MODEL NO：B140XW01 V8

  PART NO：91.14B38.848

  CUSTOMER NO：

  CARTON NO：

  Made in China   *ZM100-0652300205*

AU Optronics   QTY：35   RoHS   Pb

  MODEL NO：B140XW01 V8

  PART NO：91.14B38.84A

  CUSTOMER NO：

  CARTON NO：

  Made in China   *ZM100-0652300205*

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2B		01	00000001	1
2C	Standard timing #4	01	00000001	1
2D		01	00000001	1
2E	Standard timing #5	01	00000001	1
2F		01	00000001	1
30	Standard timing #6	01	00000001	1
31		01	00000001	1
32	Standard timing #7	01	00000001	1
33		01	00000001	1
34	Standard timing #8	01	00000001	1
35		01	00000001	1
36	Pixel Clock/10000　LSB	12	00010010	18
37	Pixel Clock/10000　USB	1B	00011011	27
38	Horz active　**Lower 8bits**	56	01010110	86
39	Horz blanking　**Lower 8bits**	46	01000110	70
3A	HorzAct:HorzBlnk　　**Upper 4:4 bits**	50	01010000	80
3B	Vertical Active　**Lower 8bits**	00	00000000	0
3C	Vertical Blanking　　**Lower 8bits**	23	00100011	35
3D	Vert Act : Vertical Blanking　　**(upper 4:4 bit)**	30	00110000	48
3E	HorzSync. Offset	26	00100110	38
3F	HorzSync.Width	16	00010110	22
40	VertSync.Offset : VertSync.Width	36	00110110	54
41	Horz&Vert Sync Offset/Width **Upper 2bits**	00	00000000	0
42	Horizontal Image Size　**Lower 8bits**	35	00110101	53
43	Vertical Image Size　**Lower 8bits**	AD	10101101	173
44	Horizontal & Vertical Image Size　**(upper 4:4 bits)**	10	00010000	16
45	Horizontal Border　*(zero for internal LCD)*	00	00000000	0
46	Vertical Border　*(zero for internal LCD)*	00	00000000	0
47	Signal *(non-intr, norm, no stero, sep sync, neg pol)*	18	00011000	24
48	Detailed timing/monitor	00	00000000	0
49	descriptor #2	00	00000000	0
4A		00	00000000	0
4B		0F	00001111	15
4C		00	00000000	0
4D		00	00000000	0
4E		00	00000000	0
4F		00	00000000	0
50		00	00000000	0
51		00	00000000	0
52		00	00000000	0
53		00	00000000	0
54		00	00000000	0
55		00	00000000	0
56		00	00000000	0
57		00	00000000	0
58		00	00000000	0
59		20	00100000	32

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5A	Detailed timing/monitor	00	00000000	0
5B	descriptor #3	00	00000000	0
5C		00	00000000	0
5D		FE	11111110	254
5E		00	00000000	0
5F	Manufacture	41	01000001	65
60	Manufacture	55	01010101	85
61	Manufacture	4F	01001111	79
62		0A	00001010	10
63		20	00100000	32
64		20	00100000	32
65		20	00100000	32
66		20	00100000	32
67		20	00100000	32
68		20	00100000	32
69		20	00100000	32
6A		20	00100000	32
6B		20	00100000	32
6C	Detailed timing/monitor	00	00000000	0
6D	descriptor #4	00	00000000	0
6E		00	00000000	0
6F		FE	11111110	254
70		00	00000000	0
71	Manufacture P/N	42	01000010	66
72	Manufacture P/N	31	00110001	49
73	Manufacture P/N	34	00110100	52
74	Manufacture P/N	30	00110000	48
75	Manufacture P/N	58	01011000	88
76	Manufacture P/N	57	01010111	87
77	Manufacture P/N	30	00110000	48
78	Manufacture P/N	31	00110001	49
79	Manufacture P/N	20	00100000	32
7A	Manufacture P/N	56	01010110	86
7B	Manufacture P/N	38	00111000	56
7C		20	00100000	32
7D		0A	00001010	10
7E	Extension Flag	00	00000000	0
7F	Checksum	17	00010111	23